



HERCA Working group on  
Emergencies – Task force

-  
Application of the HERCA-WENRA-  
Approach:  
Ukraine conflict 2022

May 2022

---

**Title:**                    **Application of the HERCA-WENRA-Approach: Ukraine conflict 2022**

**Summary:**                This document aims to provide elements to ease the application of the HERCA-WENRA Approach (HWA) in the Ukraine conflict situation.

---

## **LIST OF ABBREVIATIONS**

ChNPP	Chornobyl nuclear power plant
DG	Diesel Generator
EC	European Commission
ECURIE	European Community Urgent Radiological Information Exchange
EP&R	Emergency Preparedness & Response
ENSREG	European Nuclear Safety Regulators Group
EURDEP	EUropean Radiological Data Exchange Platform
HERCA	Heads of the European Radiological protection Competent Authorities
HWA	HERCA-WENRA Approach
IAEA	International Atomic Energy Agency
IRMIS	International Radiation Monitoring Information System IRMIS
ITB	Iodine Thyroid Blocking
NNP	Nuclear Power Plant
PWR	Pressurised Water Reactor
RANET	Response and Assistance Network
SNRIU	State Nuclear Regulatory Inspectorate of Ukraine
USIE	Unified System for Information Exchange in Incidents and Emergencies
WENRA	Western European Nuclear Regulators Association
WGE	Working Group Emergencies (of HERCA)

## CONTENTS

1. Introduction	5
1.1. WGE Task Force - Ukraine conflict support objective	5
2. HERCA-WENRA Approach	6
2.1. Underlying principles to be considered	8
2.2. Other issues to be considered	8
3. Practical considerations in the application of HWA to support the Ukraine crisis	9
3.1. Before any emergency is declared	9
3.1.1. Target audience: Ukraine and neighbouring countries	9
3.1.2. Target audience: Rest of countries	10
3.2. If abnormal observations are detected by national environmental monitoring networks	10
3.2.1. Target audience: All the countries	10
3.3 If an emergency (not general emergency yet) has been declared	10
3.3.1. Target audience: Ukraine (or accident country)	10
3.3.2. Target audience: Neighbouring countries	11
3.3.3. Target audience: Rest of the countries	11
3.3.4. Target audience: HERCA Board of Heads/ other international organisations	11
3.4. If a general emergency is declared (in the early phase)	12
3.4.1 Target audience: Ukraine (or accident country)	12
3.4.2. Target audience: Neighbouring countries	13
3.4.3. Target audience: Rest of the countries	13
3.4.4. Target audience: HERCA Board of Heads/ other international organisations	14
3.5 If a general emergency is declared (beyond the early phase)	14
3.5.1. Target audience: Ukraine (or accident country)	14
3.5.2. Target audience: Neighbouring countries	15
3.5.3. Target audience: Rest of the countries	16
3.5.4. Target audience: HERCA Board of Heads/ other international organisations	17
4. Conclusion	17
5. References	19

### Table(s)

Table 1: HERCA/WENRA status of neighbouring countries to Ukraine	7
Table 2: Ukraine nuclear power plants	21

### Figure(s)

Figure 1: Map illustrating geographic locations of the Ukraine NPP sites (and Chornobyl)	20
--	----

## **Annexes**

Annex 1: Ukraine Nuclear Power Plants and Chornobyl	20
Annex 2: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for the 4 NPP sites	23
Annex 3: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for Rivne and Khmelnytsky NPPs	24
Annex 4: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for South Ukraine NPP	25
Annex 5: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for Zaporizhzhya NPP	26

## 1. INTRODUCTION

1. In March 2022, the Heads of the European Radiological protection Competent Authorities (HERCA) Working Group – Emergencies (WGE) set up a 'WGE Task Force - Ukraine conflict support' with 9 countries participating and the European Commission (EC) observing. HERCA published a joint document with Western European Nuclear Regulators Association (WENRA) about the consequences of a nuclear accident on the 9 March 2022 [1]. In addition, a mandate was released detailing the mission, a road map, and the working method [2].
2. The Task Force mandate [2], takes into account the fact that a nuclear power plant (NPP) accident in Ukraine could lead to potential direct effects on the surrounding countries, and considering the HERCA-WENRA Approach (HWA), it is sensible to try and prepare a coherent and coordinated response within HERCA member states.
3. The Task Force was requested to make use of the HWA approach, the other related HERCA documents, and the principles underneath them all in order to prepare a full strategy for the HERCA members, focusing on Ukraine and its neighbouring countries, to set up provisions for a more effective response to a potential nuclear emergency having in mind the actual war circumstances in Ukraine.
4. This document was produced in consultation with all HERCA-WGE members, Ukraine and the EC. It provides summaries that relate to different stages of a nuclear emergency and 'signposts' the guidance available from the HERCA library to provide support to neighbouring European countries, so that they may enhance and coordinate their responses in the event of a NPP accident in Ukraine.
5. The HWA is an incentive approach that comprises the necessary mechanisms for countries to exchange adequate information and to achieve practical and operational solutions during an emergency leading to a uniform way of dealing with any serious radiological emergency situation, regardless of national border line, hence allowing for coherent and coordinated protective actions.
6. Throughout this document, when stating 'neighbouring countries', this refers to all countries bordering Ukraine. For the sections titled 'rest of countries', this relates to countries not bordering Ukraine.

### 1.1. WGE Task Force - Ukraine conflict support objectives

7. The HERCA-WGE Task Force has identified and agreed three key objectives/deliverables to take forward [2]:
  - i. **Preparation**
    - Identify overlays of existing HERCA documents (including the HERCA-WENRA Approach) to the situation in the Ukraine.
    - Take into account, if possible, local documentation.
    - Identify the first pragmatic needs not covered by the existing documentation; and
    - Identify relevant recommendations and seek common positions on how or when the protective actions in HERCA documents may be applied or are unlikely to be required.
  - ii. **Emergency Centres**
    - Identify the appropriate entity and coordination mechanisms during preparation phases in order to facilitate response (without duplicating the existing communication channels of IAEA USIE and EC ECURIE).
    - Identify the relevant information to be shared.

iii. **Communication**

- Internal (within HERCA, and WENRA).
- External (via the HERCA website).
- Create a fora of discussion between Ukraine and other countries on the HERCA framework related to emergency preparedness.

8. As stated above, this document addresses the first HERCA-WGE Task Force objective.

**2. HERCA-WENRA APPROACH**

9. In 2014, the Heads of the European Radiological Protection Competent Authorities (HERCA) and the WENRA published the “HERCA-WENRA Approach [3] for better cross-border coordination of protective actions during the early phase of a nuclear accident”.
10. The HWA improves the response and cross-border coordination for all types of possible accident scenarios. It contains overarching principles based on radiation safety considerations and provides an incentive for joint actions between neighbouring countries. These principles are being implemented in the HERCA member countries at the national level. Additional work has been carried out or is on-going to provide additional guidance on concepts and on inclusion of other relevant stakeholders such as civil protection services [3].
11. The approach relies on the following principles: shared technical understanding, coordination and mutual trust. It does not propose a uniform cross border framework. The main strategy is to aim at an alignment of the response between neighbouring countries or neighbouring territories. This is supported by early information exchanges using existing dedicated bilateral and international arrangements as far as possible. The principles used in the HWA are those of mutual understanding, coordination, mutual trust and alignment of recommendations for decisions between neighbouring countries and territories. The aim of the HWA is to try to provide coordinated implementation of protection strategies, including the urgent protective actions of evacuation, sheltering and iodine thyroid blocking, across national borders within Europe, and in this case, coordination between the countries bordering with Ukraine. To support this, HERCA member countries produce Emergency Preparedness and response (EP&R) fact sheets which provide details of NPPs operated, the countries’ organisational structure and protection strategies etc. [4].
12. In addition to the protective actions detailed above, HERCA documentation also provides general advice regarding food and feed restrictions. As with the other protective actions referred to in this document, the situation being experienced may influence the decision to implement certain actions e.g. food bans. HERCA documents [5] and [6] refer. In the event of a nuclear accident and/ or emergency, European regulations (Euratom #2016/52) state the Maximum Permitted Levels of contamination in foods, minor foods, and animal feed.
13. Table 1 below details the neighbouring countries and details their membership of HERCA and WENRA, along with providing a reference to the country’s fact sheets.

Table 1 – HERCA/ WENRA status of neighbouring countries to Ukraine

<b>Countries adjacent/ bordering Ukraine</b>	<b>HERCA member <sup>1</sup></b>	<b>WENRA <sup>2</sup> Member Associated member Observer</b>	<b>Civil Nuclear industry</b>	<b>HERCA EP&amp;R fact sheet <sup>3</sup></b>
Belarus	No	Observer	NPP Astravec (PWR, VVER-1200) under construction/ in operation. First of two units was connected to the grid in November 2020 <sup>4</sup>	N/A
Poland	Yes	Observer	Otwock-Swierk (MARIA research reactor 30 MW)	Version 1 July 2015
Slovakia	Yes	Member	Bohunice (PWR, VVER-440/213) Mochovce (PWR, VVER-440/213)	Version 2 April 2019
Hungary	Yes	Member	Paks 1-4 (PWR, VVER-440/213)	Version 5 April 2020
Romania	Yes	Member	Cernavoda 1 (PHWR) Cernavoda 2 (PHWR)	Version 1 March 2016
Moldova	No	No	Moldova has no nuclear power plants and research reactors [8]	N/A
Russian Federation	No	Associated member	38 nuclear units are operated in Russia at 11 sites (including floating nuclear power plant, based in Pevek) <sup>5</sup>	N/A

14. Ukraine is a member of WENRA and not a member of HERCA. However, principles of emergency preparedness and response aimed at building mutual trust and shared technical understanding were presented as elements of HERCA-WENRA Approach, have being introduced in Ukraine since 1993. During the period of 1993-2005 bilateral agreements under Notification Convention were signed between governments of Ukraine and Germany, Poland, Norway, Austria, Finland, Hungary, Slovakia, Sweden, Turkey, Belarus, Latvia, Bulgaria, Romania. Communication tests with contact points under these agreements are performed by SNRIU's Information and Emergency Centre annually. A summary of the Ukrainian NNPs and Chernobyl site can be found in Annex 1.

<sup>1</sup> <https://www.herca.org/about-herca/members/>

<sup>2</sup> <https://www.wenra.eu/membership>

<sup>3</sup> [https://www.herca.org/documents/?filter\\_type%5B%5D=80&update\\_year=](https://www.herca.org/documents/?filter_type%5B%5D=80&update_year=)

<sup>4</sup> <https://world-nuclear.org/Information-Library/Country-Profiles/countries-A-F/Belarus.aspx#:~:text=Belarus%20has%20its%20first%20nuclear,with%20two%20VVER%2D1200%20reactors.>

<sup>5</sup> <https://rosatom.ru/en/rosatom-group/power-generation/>

## 2.1. Underlying principles to be considered

15. As stated, HWA is based on the following principles:

- shared technical understanding; and
- coordination and mutual trust.

16. HWA does not propose a uniform cross border framework. The main strategy of the HWA is to aim at an alignment and consistency of the response between neighbouring countries or neighbouring territories.

17. HWA Part II relates to the early phase response to severe accidents (core melt) where very little technical information is available. It proposes consideration of the three Judgement Evaluation Factors of risk of core melt, potential for loss of containment, wind speed/direction to make decisions on the three urgent protective actions of evacuation, sheltering and potassium iodine (dependant on wind direction, speed, stability and demography). For potential/ actual core melt it recommends evacuation up to 5km and sheltering & iodine thyroid blocking (ITB) to 20km. For potential/ actual core melt and loss of containment it recommends evacuation up to 20km and sheltering & ITB to 100km [3]. See annexes 2-5 containing maps of Ukraine facilities.

18. Such principles are supported by early information exchanges using existing dedicated bilateral and international arrangements as far as possible.

19. Through engagements with the Ukrainian authorities, the State Scientific and Technical Centre for Nuclear and Radiation Safety of the State Nuclear Regulatory Committee of Ukraine have shared with the HERCA-WGE Task Force a document titled 'Implementing the HERCA-WENRA approach to improve interstate coordination of protective actions during nuclear accidents'.

20. The underlying principles of this paper, and that detailed above (paragraph 19), support a coordinated and coherent response by all countries affected, including those far distant countries which may be also affected.

## 2.2. Other issues to be considered

21. The consequences of the invasion and subsequent damage must be taken into account when considering the implementation of protective actions. The HWA was written to support the preparedness and response phases to a nuclear emergency being the primary event, i.e., a known fault sequence, and not the significant external influences being experienced in Ukraine presently. The devastation caused by the war has, and will continue to, impact the effectiveness of protective actions. For example, implementing sheltering within buildings that are damaged due to the conflict, degraded communication systems, or population evacuation under war/conflict situations and damaged transport infrastructure. The protective actions are based on offering 'the best possible' protection factor, but due to the current situation, this approach may not be considered as the best 'default' cause of action. This is important and relevant in Ukraine, as the benefits of actions recommended for radiological protection reasons may well be outweighed by alternative considerations where actions are needed to protect lives.

22. The 'Risk to Benefit' argument will need to be consider more than ever when implementing protective actions. This will include the application of food bans. It is widely documented that the population of cities in Ukraine are experiencing significant challenges sourcing basic supplies. The application of any form of food ban will need to evaluate the risk to individuals, against the risk of not being able to source an alternative supply of food/supplies.



### **3. Practical considerations in the application of HWA to support the Ukraine crisis**

23. The HWA does not overwrite or supersede national arrangements and cooperative agreements with neighbouring countries. The purpose, as stated is to support and assist in the implementation of the already agreed, shared, and tested arrangements. Many countries will have implemented these arrangements, particularly those participating in HERCA. This section is aimed at providing useful additional guidance to an accident country and to other countries of who may be impacted/ affected by an accident specific to Ukraine.

#### **3.1. Before any emergency is declared**

##### **3.1.1. Target audience: Ukraine and neighbouring countries**

24. Increase and encourage bilateral and multilateral contact among Ukraine and the neighbouring countries:

- Confirm availability of up to date of Country Fact Sheets [3] or share equivalent documents (for non HERCA countries)
- Confirm and test communication channels; [3]
  - Telephone;
  - Email;
  - Internet access to webpages with relevant information;
  - Fax, others if applicable;
- Confirm availability of environmental monitoring networks; [3], [5], [9] – which may be damaged or inaccessible)
  - Check availability and performance of national networks;
  - Confirm access to the information by neighbouring countries when it was previously granted by bilateral or multilateral agreements;
  - Consider granting access to the information of national networks to neighbouring countries which had no access yet. Previous bilateral agreements may be necessary;
  - Confirm and check access to neighbouring countries' environmental radiation networks information;
  - Consider applying for access to the information of neighbouring countries' networks when such access is not yet granted;
  - Establish a routine of periodic questioning to national and neighbouring countries networks; and
  - Check international environmental monitoring information at international platforms: European Radiological Data Exchange Platform (EURDEP), International Radiation Monitoring Information System (IRMIS), Unified System for Information Exchange in Incidents and Emergencies (USIE), and others as appropriate.

25. Review and check own EP&R arrangements and all the means and resources in order to gather information, make decisions and implement protective actions:

- Check availability of resources identified in EP&R arrangements for the response against a nuclear emergency [3], noting the significant population migrations that have occurred during the conflict, may increase significantly further in the event of an accident. This may not have been considered in the existing EP&R arrangements; and

- Consider the potential requirements of other Ukraine neighbouring countries regarding needs and resources for the response of a nuclear emergency, again noting the significant populations' changes [3] and [5].

### **3.1.2. Target audience: Rest of countries**

26. Check information:

- delivered by international organisations, i.e., position papers or statements regarding the actual situation that can affect the preparation for a potential nuclear emergency coming from international organisations.
- accessible by means of USIE and European Community Urgent Radiological Information Exchange (ECURIE); and
- available according to bi- or multilateral agreements

27. Monitor the status/ readings of national environmental monitoring networks.

28. Consider the potential requirements of neighbouring countries regarding needs and resources for the response of a nuclear emergency, again noting the significant populations changes that have occurred in those countries [1], [3].

## **3.2. If abnormal observations are detected by national environmental monitoring networks**

### **3.2.1. Target audience: All the countries**

29. Check conformity with the HERCA's definition of clearly abnormal observation [9].

30. Promptly communicate to other countries via USIE and ECURIE [3].

31. Consider activating EP&R arrangements: [3]

- If so, notify to neighbouring countries and international organisations according to:
  - Bi- or multilateral arrangements; and
  - USIE, ECURIE systems.

## **3.3. If an emergency (not general emergency yet) has been declared**

### **3.3.1. Target audience: Ukraine (or accident country)**

32. As soon as possible, notify the international organisations and neighbouring countries the following: [3]

- location of the emergency;
- accident facility;
- expected progression of the accident;
- affected area;
- expected affected areas in the near future; and
- protective actions implemented or in process of implementing.

33. Monitor the status/readings of the environmental monitoring networks [3], [5], [9].

34. Communication to the public: [3], [5]

- If possible, consider sharing with IAEA and neighbouring countries before releasing it. **IMPORTANT:** Timely, precise and trustful statements for the public are essential.

### **3.3.2. Target audience: Neighbouring countries**

35. Activate communication with the accident country and other neighbouring countries [3].
36. Identify potential areas of the national territory that could be affected in case of worsening the conditions of the accident: [3]
- Consider potential side effects due to migrating population out of Ukraine;
  - Check meteorological conditions and forecasts; and
  - Consider potential results of simulation and modelling.
37. Check/ monitor environmental radiation conditions: [3], [5]
- Monitor the status/ readings of national international environmental monitoring networks
  - Consider sending portable environmental monitoring units to the areas close to the borderline
  - Consider sending portable people monitoring and decontamination units to the areas close to the borderline

### **3.3.3. Target audience: Rest of the countries**

38. Stay alert and check information (this may include): [3], [7]
- delivered by international organisations;
  - accessible by means of USIE or ECURIE; and
  - available according to bi- or multilateral agreements.
39. Monitor the status/ readings of national environmental monitoring networks.
40. Consider informing nationals living in the accident country or in the neighbouring countries: [3], [7]
- If so, consider the information delivered by the accident country.
    - Try, to the maximum extent to align to what the accident country is doing/ informing
    - If that is not possible (mainly due to the war state, or for other reasons), consider align to what the neighbouring countries are doing/informing
41. Consider applying recommendations of HERCA published document 'Emergency Preparedness Practical proposals for further harmonisation of the reactions in European countries to any distant nuclear or radiological emergency' [7], section 7.3. Preparedness guide for Embassies:
- Listed are recognised as general considerations and recommendations to facilitate the timely preparedness of embassies potentially affected by a nuclear or radiological emergency
42. It distinguishes between minimum requirements that embassies should have in place and additional equipment, respectively measures that would be of benefit in case of a crisis, but which do not seem realistic in each case, in particular for small embassies.

### **3.3.4. Target audience: HERCA Board of Heads / other international organisations**

43. Encourage the use of the HWA and stay in contact with other international organisations: E.g. WENRA, IAEA, ENSREG, EC, etc.
44. Consider the reliability of the information coming from the 'accident country' regarding the accident scenario and implementation of EP&R arrangements.. I.e. The Ukraine authorities or the occupying Russian forces when considering application of the HWA approach and related documents [3], [5], [7].

### **3.4. If a general emergency is declared (in the early phase)**

#### **3.4.1. Target audience: Ukraine (or accident country)**

45. As soon as possible, notify the international organisations and neighbouring countries the following: [3]
- location of the emergency;
  - accident facility;
  - emergency category;
  - description of the accident;
  - local weather conditions and forecast;
  - expected progression of the accident;
  - affected area;
  - expected affected areas in the near future; and
  - protective actions implemented or in process of implementing.
46. Monitor the status/readings of environmental monitoring networks: [3], [5], [9]
47. Implementation of the HWA:
- Have provisions of the HWA part II been applied? Report of distances and details [3], [10]
  - What other protective actions beyond of those considered in the HWA part II have been implemented? Report distances and details [6].
  - Consider the full affected area in order to implement protective actions (not only the part with the national territory) [3], [10], [6].
    - Notify the neighbouring countries with affected areas within their national territories
48. Outcomes of simulations of dispersion and radiological consequences modelling:
- Share with international organisations (USIE) and neighbouring countries [3]
  - Need for assistance?
    - Response and Assistance Network (RANET), EU Civil Protection Mechanism and rescEU
    - According to bi- or multilateral agreements
49. Any other type of assistance:
- Report and/ or request accordingly (RANET, USIE, ECURIE, bi- or multilateral agreements, HERCA, WENRA, ENSREG, etc.)
50. Communication to the public: [3], [5]
- If possible (such that it does not adversely affect the implementation of urgent protective actions), consider sharing with IAEA and neighbouring countries before releasing it. IMPORTANT: Timely, precise and trustful statements for the public are essential.
  - Try to ensure that all statements released to the public based on outcomes, are accordance with a common understanding with neighbouring countries.

### 3.4.2. Target audience: Neighbouring countries

51. Assess the capability of the accident country to fully act according to the HWA.

- NOTE: Given the actual situation of war in Ukraine, some of the provisions by the HWA may not be implemented. In such a case, in order to coordinate the response of the neighbouring countries as well as the international organisations and other far distant countries, it may be helpful to consider the most affected neighbouring country as the accident country, for the purpose of applying HWA provisions.

52. Activate communication with the accident country and other neighbouring countries [3].

53. Identify potential areas of the national territory that could be affected, namely: [3]

- Consider effects due to migrating population in/ out of Ukraine;
- Check meteorological conditions and forecasts; and
- Consider potential results of simulation and modelling.

54. Check/ monitor environmental radiation conditions: [3], [5]

- Monitor the status/readings of national and international environmental monitoring networks
- Consider sending portable environmental monitoring units to the areas close to the borderline
- Consider sending portable people monitoring and decontamination units to the areas close to the borderline

55. Consider following what the accident country (or if relevant, the most affected neighbouring country) is doing: [3], [5]

- Implementing protective actions that are coherent with those by the accident country in the affected areas of the national territory
- Develop statements to the public that are coherent with those delivered by the accident country
  - Consider reviewing the statements by IAEA and neighbouring countries.
  - Consider releasing joint statements to the public by all neighbouring countries and international organisations.
  - IMPORTANT: Timely, precise and trustful statements for the public are essential.

56. Identify affected areas in the national territory that may require other protective actions beyond those of the HWA part II [6]

- Before implementing consider inform/ discuss with other neighbouring countries that may be equally affected, according to: [3]
  - Environmental monitoring
  - Outcomes of simulations
  - Others

### 3.4.3. Target audience: Rest of the countries

57. Stay alert and check information: [3], [7]

- delivered by international organisations;
- accessible by means of USIE or ECURIE; and
- available according to bi- or multilateral agreements

58. Monitor the status/readings of national environmental monitoring networks
59. Consider informing nationals living in the accident country or in the neighbouring countries: [3], [7]
- If so, consider the information delivered by the accident country.
    - Try, to the maximum extent to align to what the accident country is doing/ informing
    - If that is not possible (mainly due to the war state, or for other reasons), consider align to what the neighbouring countries are doing/informing
60. Consider applying recommendations of the HERCA published document 'Emergency Preparedness Practical proposals for further harmonisation of the reactions in European countries to any distant nuclear or radiological emergency' [7], section 7.3. Preparedness guide for Embassies:
- Listed are recognised as general considerations and recommendations to facilitate the timely preparedness of embassies potentially affected by a nuclear or radiological emergency
61. If the country has capabilities to produce reliable simulation and modelling of the radiological consequences of the ongoing accident: [3]
- Share the outcomes with other countries and international organisations in order to develop a common understanding of the situation accepted by all parts (countries, international organisations, etc.)
  - Try to ensure that all statements released to the public based on outcomes, are accordance with a common understanding with neighbouring countries.

#### **3.4.4. Target audience: HERCA Board of Heads/ other international organisations**

62. Encourage the use of the HWA and stay in contact with other international organisations: E.g. WENRA, IAEA, ENSREG, EC, etc.
63. Consider the reliability of the information coming from the 'accident country' regarding the accident scenario and implementation of EP&R arrangements. I.e. The Ukraine authorities or the occupying Russian forces when considering application of the HWA approach and related documents. [4], [6], [8]
64. Encourage the common sharing of:
- outcomes of simulations and modelling of the radiological consequences of the ongoing accident; and
  - other type of relevant information in order to develop a common understanding of the situation that can assist issuing of communications to the public by different countries and organisations that are coherent, compatible, complementary and true. [3], [10], [7]

#### **3.5. If a general emergency is declared (beyond the early phase)**

##### **3.5.1. Target audience: Ukraine (or accident country)**

65. Keep the international organisations and neighbouring countries detailed informed about: [3]
- Location of the emergency
  - Accident facility
  - Emergency category

- Description of the accident
- Local weather conditions and forecast
- Expected progression of the accident
- Affected area
- Expected affected areas in the near future
- Protective actions implemented or in process of implementing
- Expected end of the accident

66. Monitor the status/readings of availability of environmental monitoring networks: [3], [5], [9]

67. Implementation of the HWA:

- Keep the international organisations and neighbouring countries informed about: [3], [10], [6]
  - Protective actions implemented
  - Areas and distances
  - Extension of areas to implement protective actions [11]
- Consider the full affected area in order to implement and extend protective actions (not only the part with the national territory) [3], [10], [6] and [11]
  - Notify the neighbouring countries with affected areas within their national territories

68. Outcomes of simulations of dispersion and radiological consequences modelling:

- Share with international organisations and neighbouring countries [3]
- Need for assistance?
  - RANET, USIE
  - According to bi- or multilateral agreements

69. Any other type of assistance:

- Report and/ or request accordingly (RANET, USIE, ECURIE, bi- or multilateral agreements, HERCA, WENRA, ENSREG, etc.)

70. Communication to the public: [3], [5]

- Consider reviewing by IAEA and neighbouring countries before releasing it (whilst not adversely affecting the implementation of urgent protective actions). IMPORTANT: Timely, precise and trustful statements for the public are essential.

### **3.5.2. Target audience: Neighbouring countries**

71. Check/monitor communication with the accident country and other neighbouring countries [3]

72. Identify potential areas of the national territory that could be affected: [3]

- Consider potential side effects due to migrating population out of Ukraine
- Check meteorological conditions and forecasts
- Consider potential results of simulation and modelling.

73. Check/ monitor environmental radiation condition: [3] and [9]

- Monitor the status/ readings of national and international networks



- Consider sending portable environmental monitoring units to the areas close to the borderline
- Consider sending portable people monitoring and decontamination units to the areas close to the borderline

74. Consider following what the accident country is doing: [3], [5]

- Implementing protective actions that are coherent with those by the accident country in the affected areas of the national territory
- Pay attention to the extension of protective actions by the accident country which could go beyond the borderline into the national territory [3], [11]
- Develop statements to the public that are coherent with those delivered by the accident country
  - Consider reviewing the statements by IAEA and neighbouring countries.
  - Consider releasing joint statements to the public by all neighbouring countries and international organisations.
  - IMPORTANT: Timely, precise and trustful statements for the public are essential.

75. Identify affected areas in the national territory that may require other protective actions beyond those of the HWA part II [6]

- Before implementing consider inform/discuss with other neighbouring countries that may be equally affected, according to: [3]
  - Environmental monitoring
  - Outcomes of simulations
  - Others

76. Identify areas of own EP&R arrangements that may clash with decisions taken by the accident country (Ukraine): [3], [10], recognising that the conditions in Ukraine may change substantially over short periods of time.

- To cope with the differences and inconsistencies that may appear, develop a strategy for:
  - Decisions to be taken;
  - Statements to the public regarding such decisions

### **3.5.3. Target audience: Rest of the countries**

77. Stay alert and check information: [3],

- delivered by international organisations
- Accessible by means of USIE or ECURIE
- Available according to bi- or multilateral agreements

78. Monitor the status/ readings of national environmental monitoring networks.

79. Consider informing nationals living in the accident country or in the neighbouring countries: [3] and [7]

- If so, consider the information delivered by the accident country.
  - Try, to the maximum extent to align to what the accident country is doing/ informing
  - If that is not possible (mainly due to the war state, or for other reasons), consider align to what the neighbouring countries are doing/informing



- Identify areas of own EP&R arrangements that may clash with decisions taken by the accident country: [3] and [10]
80. Consider applying recommendations of HERCA published document ‘Emergency Preparedness Practical proposals for further harmonisation of the reactions in European countries to any distant nuclear or radiological emergency’ [7], section 7.3. Preparedness guide for Embassies:
- Develop a strategy to deal with the people coming from areas of the accident country or neighbouring countries affected by the accident [11].
81. Identify actions regarding contaminated food, feeds and goods coming from the accident country: [11]
- Before implementing such actions consider inform/ discuss with other neighbouring countries and international organisations
82. If the country has capabilities to produce reliable simulation and modelling of the radiological consequences of the ongoing accident; [3]
- Share the outcomes with other countries and international organisations in order to develop a common understanding of the situation accepted by all parts (countries, international organisations, etc.); and
  - Be cautious and recognise the potential adverse consequences of releasing a statement to the public based on outcomes that have not been accepted by other countries / organisations through a process for developing a common understanding of the situation.

#### **3.5.4. Target audience: HERCA Board of Heads/ other international organisations**

83. Encourage the use of the HWA and stay in contact with other international organisations: WENRA, IAEA, ENSREG, EC, etc.
84. Consider the reliability of the information coming from the ‘accident country’ regarding the accident scenario and implementation of EP&R arrangements. I.e., The Ukraine authorities or the occupying Russian forces when considering application of the HWA approach and related documents [4], [6], [8].
85. Encourage the common sharing of:
- outcomes of simulations and modelling of the radiological consequences of the ongoing accident; and
  - other type of relevant information.
- in order to develop a common understanding of the situation that can assist issuing of communications to the public by different countries and organisations that are coherent, compatible, complementary and true [3], [10] and [7].

#### **4. CONCLUSION**

86. Detailed within this paper are the key aspects from the suite of HERCA documents. Whilst these documents have no legal binding. They are available and written to support and provide advice and guidance to Ukraine’s and neighbouring countries preparedness arrangements, to try and maximise coordination and consistency in the implementation of protective actions should an emergency occur.
87. This document is aimed to provide some guidance which will support and where appropriate help enhance the national emergency arrangements already in place in Ukraine and neighbouring countries. The HWA is written to improve the response and cross-border coordination for all

types of possible NPP accident scenarios. It contains overarching principles based on radiation safety considerations and provides an incentive for coordinated actions between neighbouring countries that may enhance their effectiveness.

88. In addition, and as stated, the approach relies on the following principles: shared technical understanding, coordination, and mutual trust. It does not propose a uniform cross border framework. The main strategy is to aim at an alignment of the response between neighbouring countries and other potentially affected countries. This is supported by early information exchanges using existing dedicated bilateral and international arrangements as far as possible. The aim of the HWA is to try to provide coordinated implementation of protection strategies, including the urgent protective actions of evacuation, sheltering and ITB, across national borders within Europe. In this case the countries bordering with Ukraine.
89. This guidance is provided to support the application of the HWA principles to a very specific situation where unusual and very dramatic factors have been added to the scenarios considered when HWA was developed. The war scenario, including significant migrating populations, reduced effectiveness of protective actions, as well as other factors such as the reliability of information coming from a war zone/ occupying forces, is addressed in order to improve the effectivity and coherence of the response among all affected countries (accident, neighbouring and far distant countries) as well as international organisations, including HERCA.
90. At the request of neighbouring countries, HERCA may be able to provide additional guidance at the planning stage.

## 5. REFERENCES

- [1] Heads of the European Radiological protection Competent Authorities (HERCA), “War in Ukraine: WENRA and HERCA conclusions on the consequences of a nuclear accident,” 2022.
- [2] Heads of the European Radiological protection Competent Authorities (HERCA) , “HERCA WGE Task Force - Ukraine conflict support Mandate,” 20 May 2022.
- [3] Heads of the European Radiological protection Competent Authorities, “General Presentation of the HERCA-WENRA Approach for a better cross-border coordination of protective actions during the early phase of a nuclear accident,” HERCA, 2014.
- [4] Heads of European Radiological protection Competent Authorities , “EP&R Country Fact Sheets,” 2021.
- [5] HERCA Working group on Emergencies - Guidance document on the HERCAWENRA, “Guidance document on the HERCAWENRA- Approach: Guidance for Bilateral Arrangements,” 2015.
- [6] HERCA Working group on Emergencies, “Guidance document on the HERCAWENRA - Approach: Additional urgent protective actions during the initial phase of a nuclear emergency,” 2019.
- [7] Heads of the European Radiological protection Competent Authorities, “Emergency Preparedness Practical proposals for further harmonisation of the reactions in European countries to any distant nuclear or radiological emergency,” HERCA, 2013.
- [8] IAEA, “Republic of Moldova National Agency on Regulation of Nuclear and Radiological Activities,” 2016.
- [9] HERCA Position Paper, “Sharing Actively Information among Competent Authorities in case of Abnormal Observations”.
- [10] HERCA Working group on Emergencies , “HERCA Working group on Emergencies - Guidance document on the HERCAWENRA-Approach: Supplementary Glossary of Concepts,” 2019.
- [11] Guidance document on the HERCA WENRA-Approach, “Strategies for extension of evacuation, sheltering and ITB protective actions,” 2019.
- [12] Ukraine National Report, “Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management,” 2020.

## Annex 1: Ukraine Nuclear Power Plants and Chornobyl

1. Detailed below provides an understanding of the Ukrainian nuclear industry, what the major nuclear facilities are, and to provide an understanding of how resilient these facilities are to potential hazards that they might experience during the current/on-going situation.
2. The Ukrainian regulator, the 'State Nuclear Regulatory Inspectorate of Ukraine (SNRIU)' <https://snriu.gov.ua/en> provides updates on the state of the operating power reactors on their website and informing the International Atomic Energy Agency (IAEA), via the Unified System for Information Exchange on Incidents and Emergencies (USIE) system, of any incidents that affect nuclear safety.
3. Figure 1 illustrates the geographic locations of the four NPP sites and Table 2 provides details of the NPPs operated.

Figure 1 – Map illustrating geographic locations of the Ukraine NPP sites (and Chornobyl)



### Ukrainian operating nuclear power plants

4. There are 15 operating NPPs in Ukraine on 4 sites which are all Russian designed VVER types. The VVER NPPs in Ukraine are relatively modern (mainly built in the 1980s and 1990s) and are water cooled and water moderated.
5. The VVER-1000 reactors are of a reasonably standard pressurised water reactor (PWR), type design contained within a re-enforced concrete reactor containment building where the spent fuel pools are inside the confinement systems. The VVER-440/ 213 reactors (Rivne 1 & 2) have a confinement system (Accident localisation system with bubbler condenser) where the spent fuel pool is outside the confinement system. These reactors have been designed and are resilient against multiple initiating events, including loss of off-site power and loss of heat sink events. Operator actions are required to maintain safety, including to ensure the continued availability of power supplies and/or core cooling following a disruption to normal cooling. The main difference compared to western PWRs are the horizontal steam generators which contain a larger secondary circuit inventory.

Table 2 – Ukraine nuclear power plants

NPP	Power Unit No.	Power capacity, MW	Reactor Type	Date of Commissioning
Zaporizhzhya	1	1000	V-320	December 1984
	2	1000	V-320	July 1985
	3	1000	V-320	December 1986
	4	1000	V-320	December 1987
	5	1000	V-320	August 1989
	6	1000	V-320	October 1995
South Ukrainian	1	1000	V-302	December 1982
	2	1000	V-338	January 1985
	3	1000	V-320	September 1989
Rivne	1	420	V-213	December 1980
	2	415	V-213	December 1981
	3	1000	V-320	December 1986
	4	1000	V-320	October 2004
Khmelnysky	1	1000	V-320	December 1987
	2	1000	V-320	August 2004

6. All reactor units have spent fuel pools on each site for initial storage pending a long-term solution. Spent fuel from Rivne NPP, Khmelnytsky NPP and South Ukraine NPP has been transferred to Russia for storage and reprocessing. In addition, there is a dry fuel storage facility located at Zaporizhzhya NPP common for the 6 reactor units. It should be noted that the dry fuel storage casks do not have a secondary containment building.
7. Radioactive waste arising from NPP operation (including High or Intermediate level waste) is stored on site in a variety of facilities.
8. Ukraine does not undertake any domestic spent fuel reprocessing.
9. All Ukrainian NPPs have been subject to the post-Fukushima European Nuclear Safety Regulators Group (ENSREG) stress tests, which reported:
  - Robustness of power supply is inherent in the plant designs. Each VVER power unit is designed to have three independent essential power supply trains, each train containing a diesel generator (DG) and batteries.
  - All DGs at all stations are provided with a 7-day reserve of diesel fuel and the DGs are designed for unattended operation in emergency mode for 250-hours.
  - All stations have the possibility of connection to other power sources (e.g., nearby coal fired or hydro-power plant).
  - Emergency cooling is provided by an Emergency Core Cooling System or via secondary system steam dump.
10. The safety systems, timescales, and the progress of faults (such as loss of electrical supplies) for the Ukrainian reactors would be comparable to most contemporary PWRs.
11. As the reactors are of Russian design a large part of the supply chain for the power stations will come from Russia, however it is likely that the supply chains will also be supported by European countries and America. Disruptions to the supply chain have the potential to affect long-term operations but if stocks of essential supplies and spares are available on sites the short-term

impact should be limited. HERCA does not have any specific information about stocks of essential supplies.

12. All reactors are currently operational (including outages/ scheduled maintenance and local restriction due to seasonal reductions in electricity).

There are 3 research reactors in Ukraine:

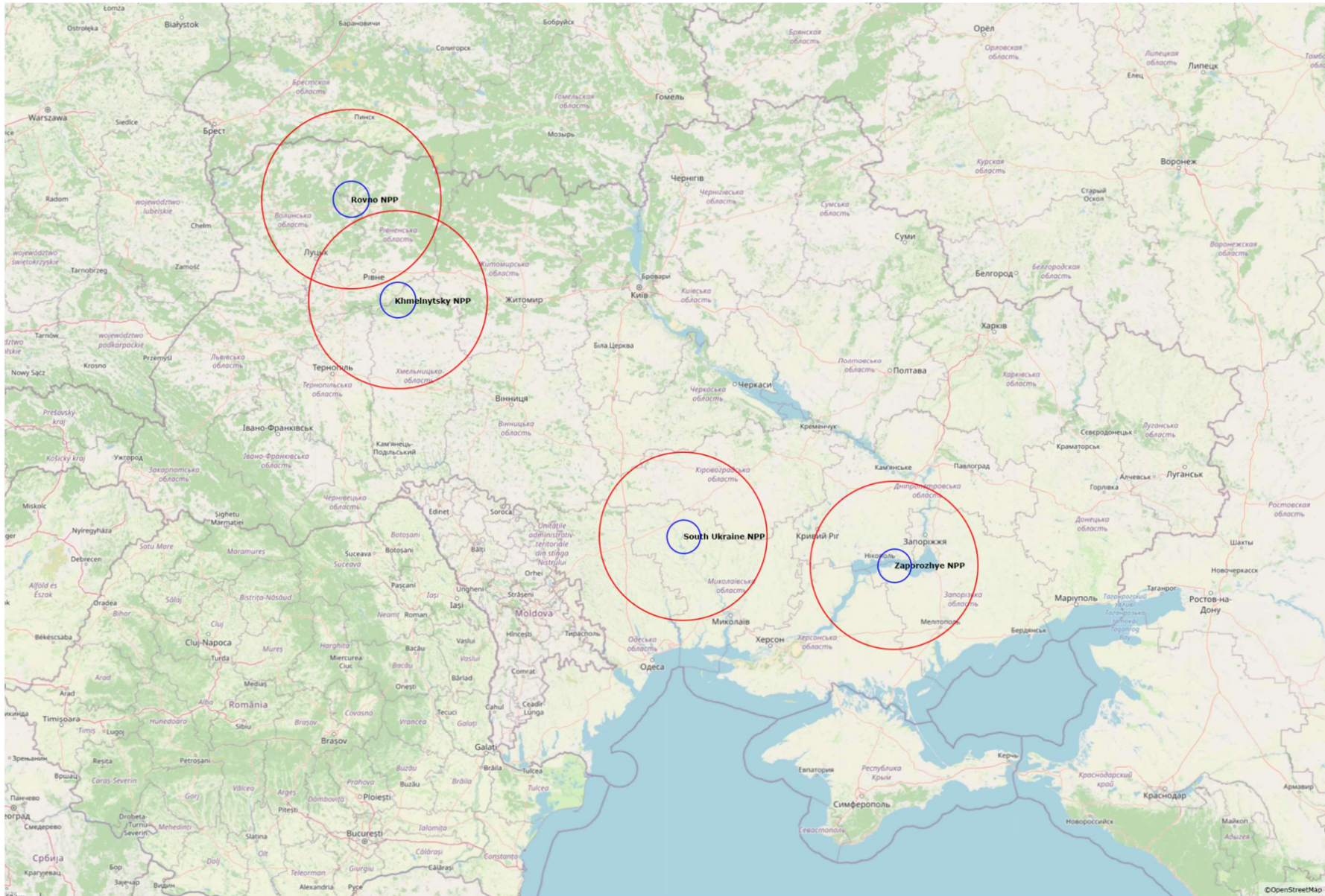
- research reactor WWR-M at Institute for Nuclear Research (10 MWth) in Kiev;
- research reactor IR-100 at Sebastopol Institute of Nuclear Energy and Industry (200 kWth); and
- a subcritical neutron source at National Scientific Centre “Charkiv Physics Technical Institute” (350 kWth), site and buildings of which has been partly damaged due to war activities.”

## **Chornobyl**

13. The Chornobyl NPP (ChNPP) site is situated in the north of the Kyiv region on the Pripjat river. The ChNPP consisted of 4 nuclear power reactors of a Soviet RBMK type design. The first reactor was commissioned in 1977.
14. There was a major accident on unit 4 in 1986, which resulted in a 30km exclusion zone been setup. Unit 3 continued to operate until December 2000. Units 1, 2 and 3 are currently being decommissioned and the fuel has been moved to a spent nuclear fuel storage facility (see below). The remains of Unit 4’s reactor core is located within the basements of the facility and does not require active cooling (although ventilation is likely to be required to control contamination within the facility). A new safe confinement structure has been installed around Unit 4 (the damaged reactor).
15. There are ~22,000 assemblies of spent nuclear fuel at the storage site. As of 1 July 2020, all ChNPP nuclear fuel is stored in a central wet spent fuel storage facility ISF-1. A central dry spent fuel storage facility ISF-2 has been completed and fuel is being processed and transferred to this facility. The transfer of fuel from ISF-1 to ISF-2 began in 2021. The ISF-2 facility is designed to be passively safe and does not require any active cooling or ventilation. The spent nuclear fuel within ISF-2 is stored in substantial packages within concrete cells. Further information/ pictures are available at [12]. ISF-2 is planned as the central storage for all spent fuel in from ChNPP.
16. Within the exclusion zone there are also a number of other facilities which are either being decommissioned or provide long term storage for the processing and storage of radioactive waste.

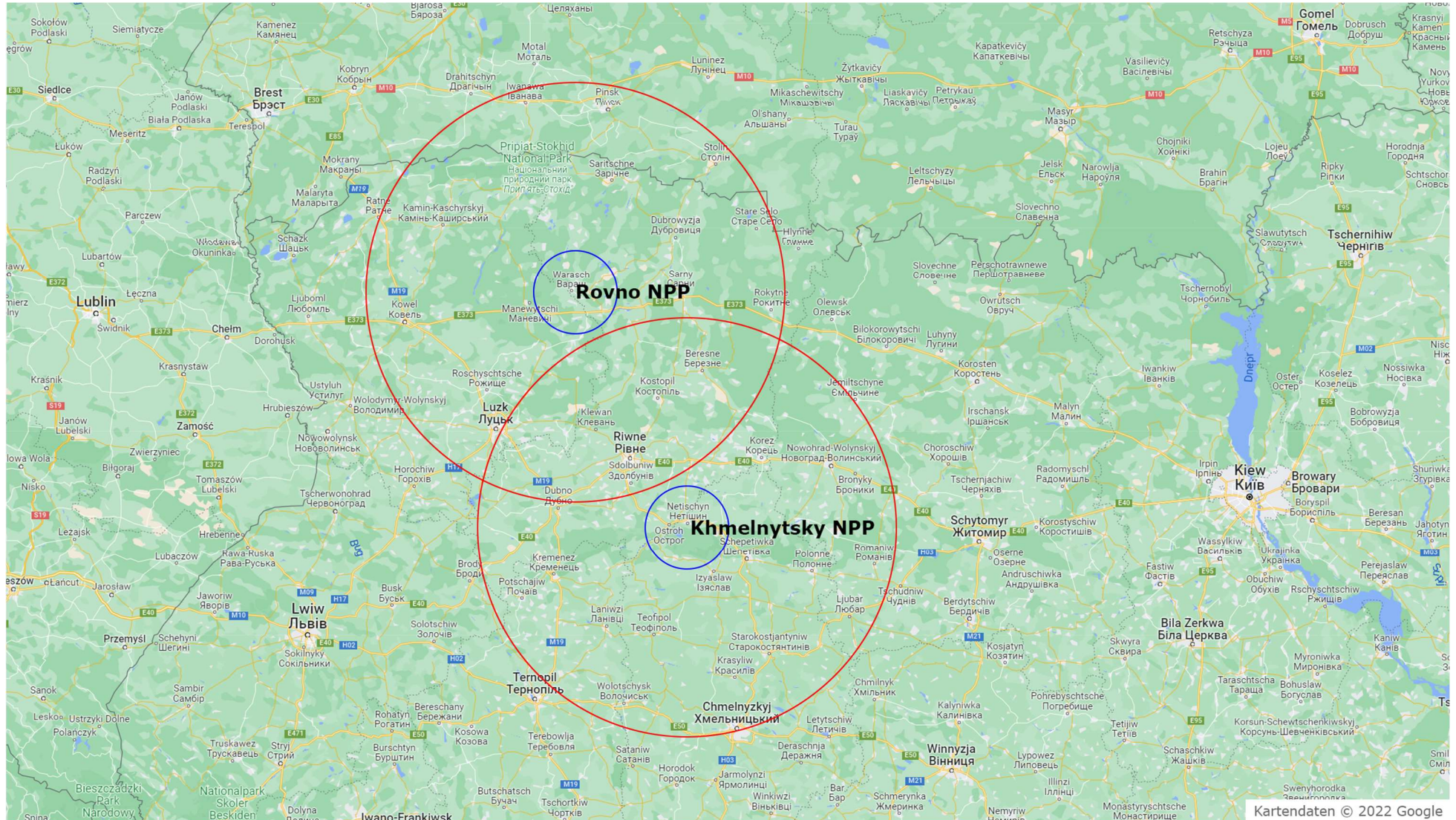


**Annex 2: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for the 4 NPP sites**



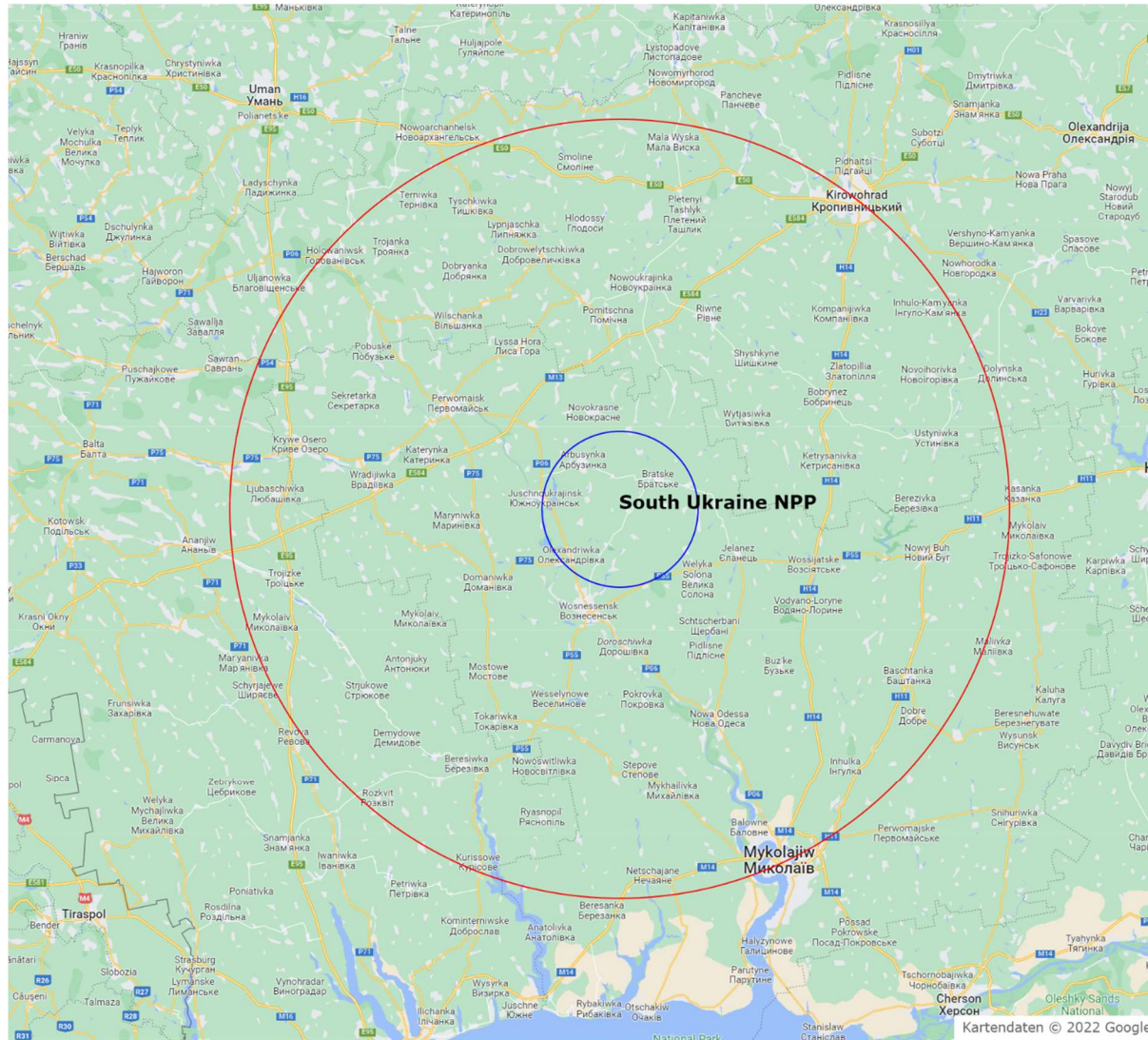


**Annex 3: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for Rivne and Khmelnytsky NPPs**





**Annex 4: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for South Ukraine NPP**



**Annex 5: Planning radii of extended evacuation up to 20km and sheltering up to 100km for protection measures based for Zaporizhzhya NPP**

